Center Independent Research & Development: GSFC IRAD

Advanced Numerical Integration Techniques for HighFidelity SDE Spacecraft Simulation

Completed Technology Project (2012 - 2013)

Project Introduction

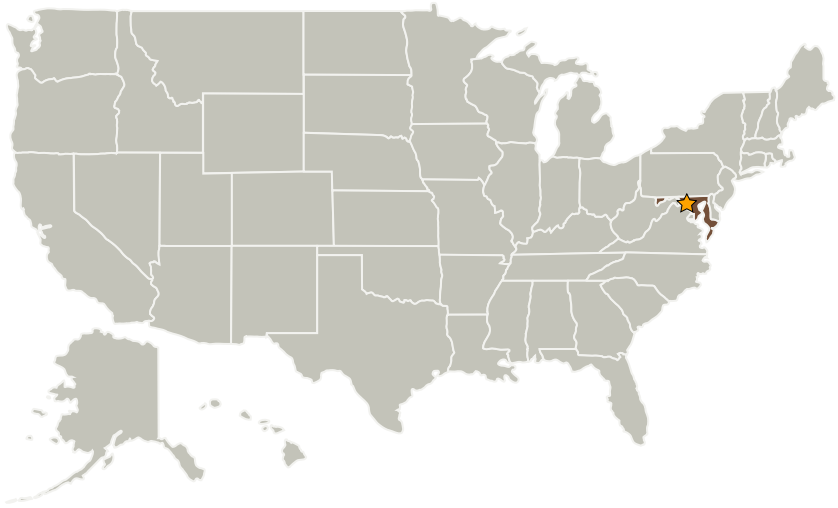
Classic numerical integration techniques, such as the ones at the heart of several NASA GSFC analysis tools, are known to work well for deterministic differential equations but have surprisingly poor performance at preserving the statistical properties when integrating stochastic differential equations (SDEs). Preliminary study has shown that these inaccuracies can lead to gross underestimation of navigation filter performance that can lead to procurement of sensing hardware that is more accurate and more expensive than needed. We propose to study the performance of numerical integrators commonly used in NASA GSFC's dynamics analysis divisions when integrating SDEs and compare their performance with SDE numerical integrators.

Study the performance of numerical integrators for flight dynamics analysis

Anticipated Benefits

N/A

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

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Table of Contents

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Primary U.S. Work Locations
Maryland

Project Website:

http://aetd.gsfc.nasa.gov/

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Manager:

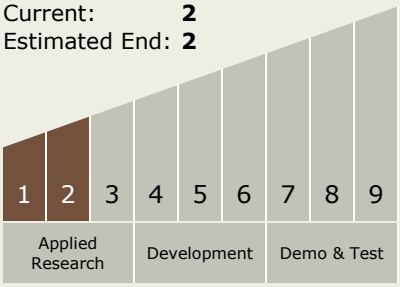
John C Adams

Principal Investigator:

Joseph M Galante

Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **2**



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.3 Simulation
    - TX11.3.6 Uncertainty Quantification and Nondeterministic Simulation Methods